Dr. Roger N. Beachy, Ph.D.

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Dr. Roger N. Beachy is internationally known for his work on virus-resistant plants. As of January 1, 1999, he assumed the position of President of the Donald Danforth Plant Science Center, in St. Louis, Missouri. As its first President, Dr. Beachy will be responsible for setting the Danforth Center's strategic direction, hiring staff and formulating its research programs. He was selected for this position following a broad, international search.

From 1991 to 1998, Dr. Beachy headed the Division of Plant Biology at The Scripps Research Institute, a leading biomedical research center, in La Jolla, California. He is also Co-Director of the International Laboratory for Tropical Agricultural Biotechnology.

Prior to joining the Scripps Institute, Dr. Beachy was a member of the Washington University biology department from 1978 to 1991. He was also Professor and Head of the Center for Plant Science and Biotechnology. His work at Washington University, in collaboration with Monsanto Company, lead to development of the world's first genetically altered food crop, a variety of tomato that was modified for resistance to virus disease. Research under Dr. Beachy's direction has led to a number of patent applications. He has edited or contributed to 50 book articles and his work has produced more than 160 journal publications and often lectures on plant biology and biotechnology. His technique to produce virus resistance in tomatoes has been replicated by other researchers to produce many types of plants with resistance to a number of different virus diseases.

Active in the scientific community, Dr. Beachy has served on numerous boards and committees including the Committee on Biological Control of Diseases of the National Research Council and the International Union of Biological Sciences. He has served as consultant for a number of companies in plant biotechnology. He is also a member of a number of scientific societies, including the American Society for Plant Physiology, American Phytopathological Society, the American Association for the Advancement of Science, American Society for Biochemistry and Molecular Biology, and the American Society for Virology, among others. In 1995, the San Diego Press Club with a Headliner of the Year Award recognized Dr. Beachy. He was the 1991 recipient of the Commonwealth Award for Science and Industry, given by the Bank of Delaware. He received the 1990 Ruth Allen Award from the American Phytopathological Society. Dr. Beachy was recently appointed to the German American Academic Council; he was elected to membership in the U. S. National Academy of Sciences in 1997.

Dr. Beachy holds a Ph.D. in plant pathology from Michigan State University. He earned a B.A. in biology from Goshen College in Goshen, Indiana.

Resistance to Virus Diseases in Transgenic Crops

In agriculture, virus diseases have traditionally been controlled by deploying genes for resistance, and when resistance genes are inaccessible, physical and chemical controls have been used. The latter include removing weeds that serve as reservoirs for viruses and insects that vector the viruses, and the use of chemical insecticides to control the insect vectors. (aphids, whiteflies, plant hoppers, etc. With the advent of gene transfer technologies, genes for disease resistance have been introduced to crops either individually or in combinations with other useful genes. Genes for resistance have come from resistant plants [e.g., the 'N' gene for resistance to tobacco mosaic virus (TMV)] and from the pathogen, applying a strategy referred to as "pathogen-derived resistance" (PDR). Using PDR, resistance has been developed via genes that encode viral RNAs but not proteins (applying RNA-based gene silencing) and genes that encode viral proteins (coat proteins and replicase proteins are most common). Examples of crops in which PDR has been used in commercial agriculture include potato (for resistance to potato leaf roll virus, potato virus Y), papaya (papaya ringspot virus), squash, melon, and other cucurbits (cucumber mosaic virus, multiple potyviruses). A variety of other crops are in various stages of development. Research has been ongoing to determine the cellular, molecular, and structural mechanisms of resistance. We developed mutants of the coat protein (CP) of TMV that are incapable of assembly, thereby eliminating concerns of non-specific trans-encapsidation of RNA, yet provide superior degrees of resistance. Some of the CPs blocks virus disassembly only, while others block disassembly plus virus replication and local spread of infection. Studies in other groups are in progress to determine the basis of resistance that is conferred by expression of genes encoding viral replicases and other proteins. Many such studies also include experiments that address certain biosafety concerns that have been raised by scientists and/or environmental groups, such as the likelihood of RNA-recombination, insect acquisition and transmission, and impacts on resistance in potential outcrossing species. These and related studies will support the validity of using certain genes, but (perhaps) not others, in transgenic crops to develop virus resistance.